

Description of two new species of *Nesogobius* (Pisces: Gobioidae: Gobiidae) from southern Australia

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Abstract

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Two new species of *Nesogobius* are described from southern Australia and compared with described species *Nesogobius pulchellus* Castelnau and *Nesogobius hinsbyi* (McCulloch and Ogilby). *Nesogobius greeni*, sp. nov. differs from *N. pulchellus* in lacking a spine in the second dorsal and anal fin and in lacking head pores. *Nesogobius maccullochi* sp. nov. differs from *N. hinsbyi* in having head pores and fewer dorsal spines and dorsal and anal rays.

Keywords

Fish, Gobioidae, Gobiidae, gobies, *Nesogobius*, new species

Introduction

The genus *Nesogobius* is confined to southern Australia. The species live over and bury in fine sand. Currently the genus contains two previously described species, *Nesogobius hinsbyi* (McCulloch and Ogilby) and *Nesogobius pulchellus* (Castelnau). Several species are known (Hoese and Larson, 1994). The two species described here have been confused with the previously described species and are named to remove that confusion. Two species have been confused under the name *Nesogobius hinsbyi*. That species is known from deep water, but the name has been incorrectly applied to a common shallow-water species. Similarly two species have been confused under the name *Nesogobius pulchellus*, but both of these species are known from shallow water and often occur together. Other species will be treated in a more comprehensive review of the genus in preparation by the authors.

Hoese (1991) suggested a possible relationship of *Nesogobius* with *Tasmanogobius*, also restricted to southern Australia. Both genera have a poorly developed posterior connection of the neural arch to the centrum on all vertebrae. The genus is atypical in having a mixture of characteristics of taxa belonging to the Gobionellinae and the Gobiinae. For example, species of Gobionellinae normally have two epurals (Pezold, 1993), but *Nesogobius* is variable, with some species having one epural and some two. In gobionellines, the interorbital canal is separated anteriorly between the eye, with paired anterior interorbital pores and posterior and anterior nasal pores. In gobiines, when pores are present, the canals are fused between the eyes, usually with a median anterior interorbital pore (only

paired in one species of *Glossogobius* or rarely paired in aberrant specimens) and no anterior nasal pore. In *Nesogobius*, when pores are present, the head canals are fused between the eyes, with a single anterior interorbital pore, as in gobiines, but with posterior and anterior nasal pores as in gobionellines.

Methods

Counts and measurements follow Hoese (1991). Institution abbreviations follow Levinton et al. (1985). The longitudinal scale count was taken from behind the pectoral base to the end of the caudal peduncle and is a count of scale rows, rather than a straight line count. The transverse scale count (TRB) is taken from the anal origin upward and backward to the second dorsal base. In descriptions an asterisk indicates count of holotype.

Comparative material examined: *Nesogobius hinsbyi* - Holotype TMH D.142, 1(62), Derwent R., Tas. AMS I.22569-001, 5(37–50), Derwent R., Tas. *Nesogobius pulchellus* - AMS I.16251-001, 7(37–42), Sydney Harbour, NSW.

Nesogobius Whitley, 1929

Nesogobius Whitley, 1929: 62 (type species *Gobius hinsbyi* McCulloch and Ogilby, 1919, by original designation).

The genus is unique in Australia in having only 13 segmented caudal rays. The genus contains 11 species all confined to southern Australia from central New South Wales to Perth, Western Australia. Most species are known only from Victoria, Tasmania and South Australia.

Nesogobius greeni sp. nov.

Figures 1–4

Nesogobius sp. 2.- Last, Scott and Talbot, 1983: 450, fig. 30.127 (Tas.).

Nesogobius sp. 3. – Hoese and Larson, 1994: 797, fig. 703 (southern Australia)

Material examined. Holotype: AMS I.25944-011, 30.5 male, Richards Point, Port Phillip Bay, Jan 1981, R. Kuiter. Paratypes: NSW: AMS I.20021-006, 1(27), Merimbula. Vic.: AMS I.25944-001, 6(17-30), taken with holotype; NMV A.29344-001, 2(30-30), Crib Point, Western Port, 4 Sep. 1974, Melbourne Univ. Zool. Dept., 0415 hr; NMV A.29345-001, 1(32), Crib Point, Western Port, 18 Oct. 1974, Melbourne Univ. Zool. Dept., 1100-1130 hrs; NMV A.29346-001, 2(30-30), Crib Point, Western Port, 20 Aug. 1974, Melbourne Univ. Zool. Dept., 0500 hrs; NMV A.29348-001, 6(27-29), reef at Beaumaris, Port Phillip Bay, 9 Jun. 1967, R. Frankenburg; NTM S.16206-001, 3(21-29), taken with holotype; AMS I.22572-006, 2(25-26), Swan Bay, Port Phillip Bay. Tas.: AMS IA.3621, 6(16-32), Southport, 1.5 fathoms, 9 Feb. 1928, T.T. Flynn; AMS I.43821001, 1(24), D'Entrecasteaux Channel, P. Last; AMS I.43824-001, 4, (26-30), D'Entrecasteaux Channel, P. Last, 3 Jul 1974; AMS I.17549-001, 6(15-24), Oyster Cove, 1 Dec. 1972, D. Hoese and W. Ivantsoff; AMS I.43825-001, 1(25), Margate, 11 Nov. 1973, T. Walker; AMS I.43822-001, 1(25), Margate, 12 Dec. 1973, T. Walker; AMS I.43818001, 8(19-31), Margate, 27-28 Jan. 1974, T.M. Walker; AMS I.17193-006, 2(27-31), Wedge Bay, May, 1976, T. Garrard; AMS I.43823-001, 1(25), Margate, 16 Jun. 1976, T. Walker; CSIRO T.1400, 1 (37), Port Davey, Kelly Basin, southwest Tas., 2 m, Mar 1979, P. Last; NMV A 29347-001, (ex QVM 1972/5/425E), 10(32-37), Kelso, R. Greene, 5 Feb 1967; QVM 1972/5/2275, 3, (19-35), Greens Beach, 8 Jan. 1967; QVM 223, 5(17-37), Greens Beach, 26 May, 1972; QVM 224, 10(26-34), Greens Beach, 5-7 Nov. 1966, R. Green; QVM 225, 6(26-34), Greens Beach, 5 Feb. 1967, R.H. Green; QVM 226, 1(35), Greens Beach, 13 Jan. 1968, R. Green. SA: AMS I.20178-010, 3(19-20), Pelican Lagoon, Kangaroo I., 8 Mar. 1978, D. Hoese and Parly.

Non-type material. Tas.: CSIRO (unreg.) 3(26-36), D'Entrecasteaux Channel, 3 Jul 1974; CSIRO (unreg.) 4(26-32), Fortesque Bay, 10 m, P. Last; CSIRO T.103, 1(28), Parsons Bay, Nubeena, 2 Nov 1978; CSIRO T.123, 1(31), Bayview Beach, Georges Bay, 2 Nov 1978; CSIRO T.1665, 1(26), Dru Point, 10 Apr 1980, University of Tasmania; CSIRO T.174, 1(36), Ansons Bay, 25 Mar 1978, P.J. Miller; CSIRO T.185, 1(37), Ansons Bay, 11 Oct 1978; CSIRO T.186, 1(29), Ansons Bay, 11 Oct 1978; CSIRO T.184, 1(38), Bogy Creek Beach, St. Helens, Jul 1978.

Diagnosis. 1st dorsal fin VII; 2nd dorsal-fin rays 8–11, rarely 8 or 11; anal-fin rays 8–10; no spine in 2nd dorsal or anal fin; branched caudal-fin rays 11–12; pectoral-fin rays 16–20; no head pores; gill opening wide, reaching forward to below or slightly before posterior preopercular margin; head with scales reaching to above preoperculum, sometimes almost to eye; dorsal mid-line of nape naked or rarely with a single scale just before 1st dorsal fin, but scales often present just to side of midline; body scales ctenoid, in 25–30 rows; midline of belly without scales or with a few scales posteriorly; pectoral base usually without scales or with 1 or 2 cycloid scales ventrally; area before pelvic fin with cycloid scales; body deep, depth at anal origin subequal to or greater than caudal fin length; 1st dorsal fin low, with rounded or triangular-shaped margin.

Description. Based on 44 males and 55 females. 1st dorsal 6(3), 7(74*); 2nd dorsal-fin rays 8–10 (see Table 1); anal-fin rays 8(15), 9(77*), 10(25); pectoral-fin rays 16(6), 17(41*), 18(52), 19(2); segmented caudal-fin rays 13(54*), 14(2); branched caudal-fin rays 10(1), 11(14*), 12(27), 13(4) midline predorsal scales 0(38), 1(2); total gill rakers 4(2), 6(5), 7(3), 8(3), 9(3); lower gill rakers on 1st arch 4(2), 5(1), 6(7), 7(2), 8(4), 9(1); lower gill rakers on 2nd arch 4(1), 5(5), 6(5); longitudinal scale count 25(6), 26(9), 27(16*), 28(7), 29(1), 30(1); TRB 7(3), 8(24), 9(2*). Head (28–32% SL), about as broad as deep; mouth small, oblique, forming an angle of 30–40° with body axis, rear end of jaws below front quarter of eye; tongue tip truncate to slightly emarginate; posterior nostril at end of short tube, almost touching eye; anterior nostril at end of short tube, positioned midway between eye and upper jaw, close to posterior nostril; snout convex in side view, forming an angle of about 45° with body axis; upper lip thick anteriorly, thin posteriorly; lower lip thin with shallow free ventral margin separating lip from mental frenum; chin with round mental frenum with a small sensory papilla at each side; eye large subequal to snout; gill rakers on outer face of 1st arch 0–1 + 4–9 = 4–8, rarely 4 or 5; rakers very short on both faces of all arches; teeth in upper jaw small, conical and wide-set, 3–4 inner rows of close-set teeth anteriorly tapering to 2 rows laterally; teeth in lower jaw small, conical and wide-set in outer row, 3–5 inner rows of smaller close-set teeth, rows tapering laterally to 1 row; body robust, body depth at anal origin 19–22% SL. 1st dorsal-fin origin above and just behind pelvic-fin insertion; 2nd dorsal-fin origin just behind 1st dorsal fin; anal-fin origin below and just behind 2nd dorsal-fin origin; pelvic-fin origin below pectoral-fin insertion; pectoral-fin margin rounded; caudal fin small, with rounded margin.

Head and body brown, green, or dark grey; lower surface of head often dark grey to black; an irregular diffuse dark brown blotch from eye to middle of jaws, and a vertically elongate blotch below eye; body with 6–8 small dark-brown to black spots on mid-side; dorsal midline often with black blotches above each mid-side spot; a series of white dashes just below mid-side; end of caudal peduncle with a <-shaped mark, extending onto caudal-fin base, sometimes broken into 2–3 separate spots at apices of triangle; females with 1–3 dark-brown vertical bars with white interspaces below 1st dorsal fin; body with scattered mottling, often forming irregularly shaped longitudinal lines; 1st dorsal fin with 2 black irregular oblique bands, with orange interspaces; 2nd dorsal fin with irregular oblique orange to brown stripes; anal fin grey; caudal fin clear to grey; pectorals and pelvic fins clear to white in males; pelvic fins almost black in female; pectoral base with an elongate brown spot dorsally.

Variation. Sex ratios were found to be almost even with 44 males and 55 females. Too few specimens were available from localities other than Tas. for a detailed analysis of variation. However, 2nd dorsal ray counts average slightly higher in southern Tas. Because of the slight differences in southern Tas. material, most of that material is excluded from the type series.

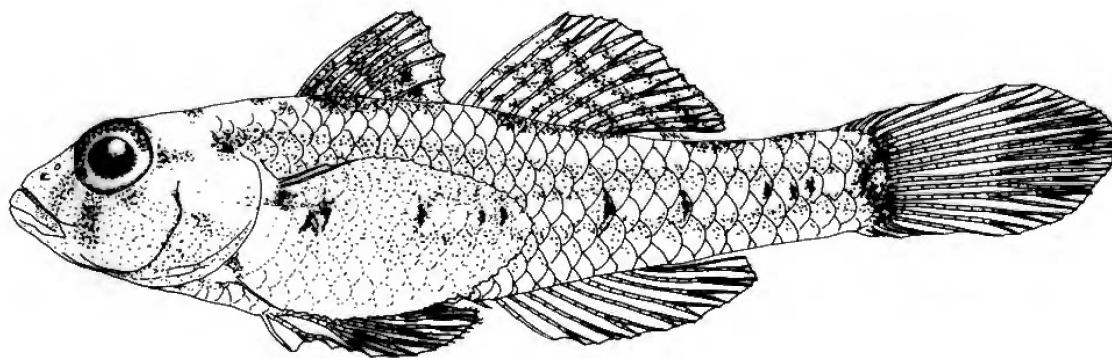


Figure 1. Holotype of *Nesogobius greeni*, AMS I.25944-001, 30.5 mm SL male, drawing by H.K. Larson.

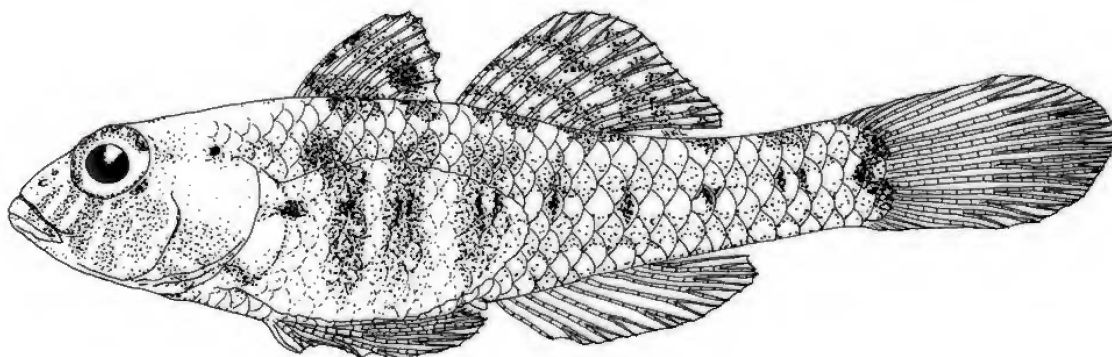


Figure 2. Paratype of *Nesogobius greeni*, AMS I.25944-002, 29.5 mm SL female, drawing by H.K. Larson.

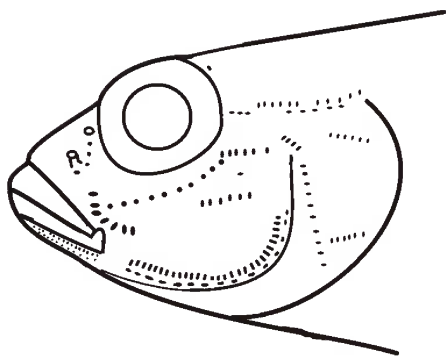


Figure 3. Head of *Nesogobius greeni*, showing papilla pattern, based on several specimens; size of papillae exaggerated, drawing D.F. Hoese.

Table 1. Second dorsal rays in various populations of *Nesogobius greeni*. Asterisk indicates count of holotype.

	8	9	10
Northern Tasmania	4	40	31
Southern Tasmania	-	4	13
Victoria	1	12	9*
New South Wales	-	1	2
South Australia	-	1	-



Figure 4. Underwater photo of *Nesogobius greeni* from type locality, photo R. Kuitert.

Distribution. *Nesogobius greeni* is known from Merimbula, NSW, throughout Tas., Vic., and east to Kangaroo I., SA. The species is normally found on sand around sea grass beds and around rocky reefs from the intertidal to depths of 8 m.

Etymology. Named for R.H. Green formerly of the Queen Victoria Museum, Launceston, Tas., who collected much of the material used in this study.

Remarks. *Nesogobius greeni* is similar to *Nesogobius pulchellus* in its coloration and deep body. Both species are often collected together at the same station. *Nesogobius greeni* differs from *N. pulchellus* in lacking second dorsal and anal spines (present in *N. pulchellus*), low first dorsal fin subequal in height to second dorsal fin (versus usually higher than second dorsal).

Nesogobius maccullochi sp nov.

Figures 5–7

Gobius hinsbyi - McCulloch and Ogilby, 1919: 215, pl. 33, fig. 1 (in part, including figured specimen).

Nesogobius sp. 1 - Last, Scott and Talbot, 1983: 449, fig. 30.126 (Tas.); Hoese and Larson, 1994: 795, fig. 701 (southern Australia)

Material examined. Holotype AMS I.17575-008, 64 mm SL female, Pinalong Bay, Tas., 6 Dec 1972, D. Hoese and W. Ivantsoff.

Paratypes: Vic.: AMS I.16987-007, 67(28–74), Peterborough, 21 Mar, 1972, D.F. Hoese and W. Congleton; AMS I.16990-002, 4(42–46), Port Phillip Bay, 23 Mar, 1972, D.F. Hoese and W. Congleton; AMS I.22943-001, 5(45–56), Rhyll, Phillip I., B. Rigby, 31 May, 1979; NMV A.3254, 1(48), Bruthen Creek estuary, Gippsland, 6 Aug, 1979, J. Buemer. SA: AMS I.17575-003, 4(50–60), taken with holotype; AMS I.17629-001, 1(38), Salt Creek Bay, south of Coobowie, St.

Vincent Gulf, 0–1 m, 23 Dec, 1973, D. Hoese and Party; AMS I.20184-005, 4(35–42), Bay of Shoals, Kangaroo I., 11 Mar, 1978, D. Hoese and B. Russell. Tas.: AMS I.17562-002, 52(19–78), Browns R., Kingston, 0–1 m, 30 Nov, 1972, D. Hoese and W. Ivantsoff; AMS I.17575-003, 6(57–68), inlet 6 km north of Binalong Bay, 0–1 m, 6 Dec, 1972, D. Hoese and W. Ivantsoff; NMV A.3257, 10(28–58), Greens Beach, 8 Jan, 1967, R.H. Green; NTM S.16210-001, 1(47), St. Helens, P. Last; QVM 220, 71(25–68), Kelso, 5 Feb, 1967, R.H. Green; QVM 221, 31(27–47), Greens Beach, 17 Oct, 1965, R.H. Green; QVM 222, 1(28), Greens Beach, 5 Feb, 1967, R.H. Green.

Non-type material: Vic.: AMS I.23456, 13(16–43), Stoney Point, Western Port; NMV A.3553, 1(24), Ricketts Point, Port Phillip Bay, 17 Feb; NMV A.3523, 2(33–35), near Geelong; NMV A.2157, 3(54–65), Portland Harbour; NMV A.3513, 1(40), Rye, Port Phillip Bay; NMV A.3522, 1(47), Rye, Port Phillip Bay; NMV A.3527, 1(48), Crib Point, Western Port; NMV A.3533, 1(51), Hovells Creek, near Geelong, Port Phillip Bay; NMV A.3534, 3(42–50), Crib Point, Western Port; NMV A.3537, 2(38–52), Crib Point, Western Port; NMV A.3538, 2(54–59), Crib Point, Western Port, 3 Sep, 1974; NMV A.3539, 1(38), Crib Point, Western Port; NMV A.3541, 2(37–41), Crib Point, Western Port; NMV A.3542, 3(36–42), Crib Point, Western Port, NMV A.3548, 1(49), 3 km W of Sandringham, Port Phillip Bay, 30 Mar, 1971; NMV A.3552, 1(41), Sorrento, Port Phillip Bay, 31 Jul, 1972. SA: AMS I.20162-027, 1(40), Stokes Bay, Kangaroo I.; AMS I.20177-013, 1(45), American R., Kangaroo I. Tas.: AMS I.14200, 1(69), Wedge Bay, paratype and figured specimen of *Nesogobius hinsbyi*.

Diagnosis. 1st dorsal fin VI–VIII, usually VII; 2nd dorsal-fin rays usually I, 8–9; anal-fin rays usually I, 8, branched caudal-fin rays usually 10; pectoral fin 17–21, rarely 21; an anterior nasal pore medial to and slightly below level of each anterior nostril and a posterior nasal pore by each posterior nostril, a median anterior interorbital pore between front of eyes, a median posterior interorbital pore between end of eyes, an

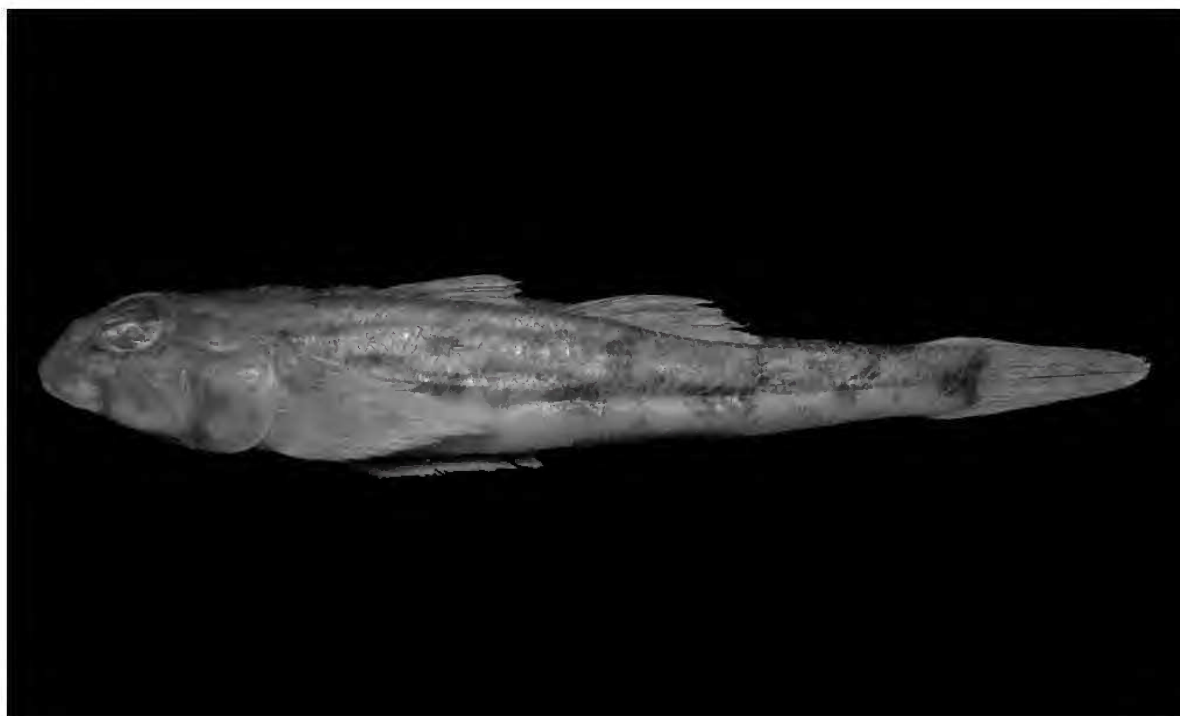


Figure 5. Holotype of *Nesogobius maccullochi*, AMS I.17575-008, 64 mm SL female, photo D. Hoese.

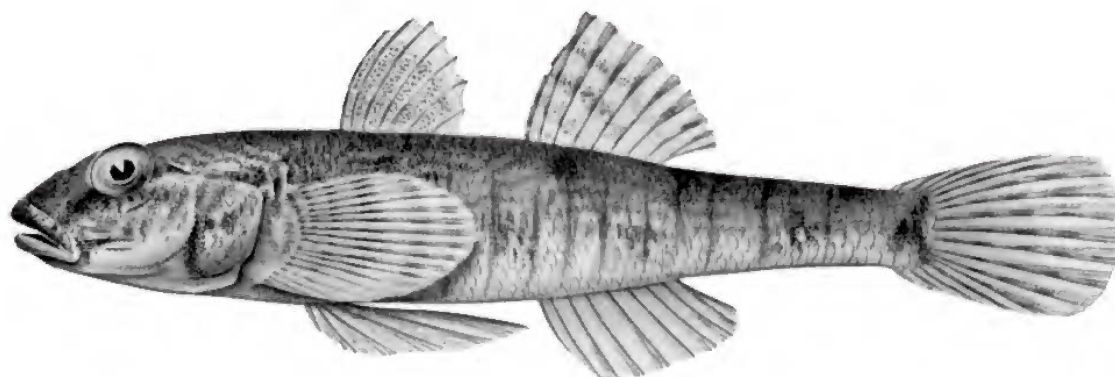


Figure 6. Paratype of *Nesogobius maccullochi* AMS I.14200, 69 mm SL male, Wedge Bay, from McCulloch and Ogilby (1919), image reversed.

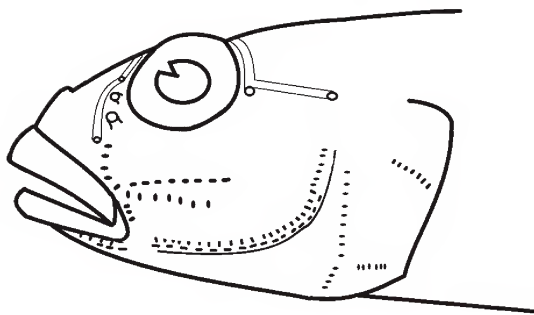


Figure 7. Head of *Nesogobius maccullochi*, showing papilla pattern, based on several specimens; size of papillae exaggerated, drawing by D. Hoese.

infraorbital pore behind each eye and a lateral canal pore along dorsal part of operculum, no preopercular pores; gill opening wide, extending to below posterior preopercular margin; top of head scaled to behind eyes, in 11–18 rows, from 1st dorsal-fin origin; operculum and preoperculum (sometimes absent on preoperculum) with a small patch of scales near dorsal margin, remainder of head without scales; body scales ctenoid, in 37–49 rows; pectoral base and area before pelvic fin scaled (about 15 rows); 1st dorsal fin with rounded or triangular margin.

Description. Based on 109 males and 155 females. 1st dorsal 5(1), 6(8), 7(159*), 8(14); 2nd dorsal rays I, 7(3), I, 8(93*), 0, 9(2), I, 9(89), 0, 10(2), I, 10(3), anal rays, I, 7(19), I, 8(134*), 0, 9(2), I, 9(28), 0, 10(2), I, 10(1); pectoral rays 17(17), 18(71*), 19(62), 20(13), 21(1); predorsal scales 12(1), 13(7), 14(27), 15(31), 16(24), 17 (15), 18(1), 19(1*); segmented caudal rays 12(2), 13(78*); branched caudal rays 9(8), 10(43), 11(1), midline predorsal scales 11(1), 13(4), 14(26*), 15(25), 16(30), 17(9), 18(1), total gill rakers 4(2), 6(5), 7(3), 8(3), 9(3); lower gill rakers on 1st arch 4(9), 5(22), 6(1); lower gill rakers on 2nd arch 4(17), 5(9), 6(4), 7(2); longitudinal scale count 37(1), 38(5), 39(6), 40(7), 41(11), 42(11), 43(8), 44(14), 45(6), 46(6*), 47(4), 48(4), 49(1); TRB 11(6), 12(14), 13(28), 14(18*), 15(4). Head (29–32% SL), broader than deep; mouth small, oblique, forming an angle of 20–25° with body axis, rear end of jaws below front margin of eye; tongue tip rounded; posterior nostril at end of short tube anterior to eye; anterior nostril at end of short tube positioned anteroventrally from posterior nostril, separated from posterior nostril by 2–3 nostril diameters; snout with an elevated bump before eyes, formed by distal tips of ascending process of maxilla; upper lip thick; lower lip thin with shallow free ventral margin anteriorly; chin with a minute round lobe, with sensory papillae from inner preopercular mandibular papilla line meeting sides of lobe; eye large, slightly shorter

than snout length; gill rakers on outer face of 1st arch 0–1 + 3–5 = 4–6; rakers short on both faces of all arches, rakers on outer face of 1st arch not larger than rakers on other arches; outer row of teeth in upper jaw enlarged and directed posteriorly, followed by 2 inner rows of smaller teeth tapering laterally to 1 row; outer row of teeth in lower jaw slightly enlarged and curved posteriorly, 1 or 2 inner rows of smaller teeth, tapering laterally to 1 row; body slender, body depth at anal origin 11–13% SL. Body robust anteriorly, slender posteriorly. 1st dorsal-fin origin just behind pelvic-fin insertion, dorsal fin low, subequal to body depth at anal-fin origin; 2nd dorsal-fin origin separated from 1st dorsal fin by 2–3 rows of scales, height of 2nd dorsal fin subequal to 1st dorsal fin; anal-fin origin below and just behind 2nd dorsal-fin origin, anal fin slightly lower than dorsal fins; pelvic-fin origin behind pectoral-fin insertion; pectoral-fin margin rounded; pelvic and pectoral fins subequal in length, slightly shorter than head length; caudal fin short, length slightly shorter than pelvic-fin length, caudal fin with truncate or slightly rounded margin.

Head and body light-grey to brown, often with scattered white and brown flecks; a black bar from eye, extending across middle of jaws; a black vertical bar from eye to just behind rear end of jaws; a vertical bar just behind posterior preopercular margin; mid-sides with 4–6 horizontally elongate dark brown spots; a round black spot at rear end of caudal peduncle, followed by and often connected to a black C-shaped mark at base of caudal fin; mature males with a series of 6–12 vertical dark brown bars on body extending onto belly; bars much thinner than intervening spaces, but variable in width and position; lower operculum, pectoral base, and belly white; dorsal and anal fins with black spots forming more or less horizontal lines; pectoral and caudal fins with small black spots forming wavy vertical bands; pelvic fins white, often with irregular mottling.

Variation. *Nesogobius maccullochi* shows considerable variation. Males differ considerably in coloration from females. Overall females outnumbered males 1.5 times. However, only two large samples were available to compare ratios and size. One sample from Kelso, Tas. contains 46 females, 21 males and four immature specimens. In a sample from Peterborough, Vic., there are 33 females and 35 males. There was no significant difference in sizes between males and females in either sample. The largest female in all the samples is 78 mm SL and the largest male 70 mm SL. In most samples the largest individual was a female. Comparisons of fin-ray counts from various populations showed no significant differences, but large samples were available from few localities. The second dorsal and anal spine are absent in less than 2% of individuals examined.

Distribution. Tas., Vic., and SA. Normally found on sandy areas in bays and estuaries, from the intertidal to depths of a few metres.

Etymology. The species is named for A.R. McCulloch, formerly Curator of Fishes at the Australian Museum. The name is given not only in recognition of his work, but indicates that this is the species which McCulloch and Ogilby confused under the name *Gobius hinsbyi*.

Remarks. This species is the most abundant species in the genus in shallow areas in southern waters. It has typically been misidentified as *Nesogobius hinsbyi*. The species differs from *Nesogobius hinsbyi* in having head pores (absent in *N. hinsbyi*), opercular scales dorsally only (versus operculum completely scaled), normally with seven dorsal spines (versus usually eight) and second dorsal-fin rays usually I,8–9 (versus I,9–10). *Nesogobius hinsbyi* occurs in deeper water and is generally taken by dredge and trawl. It should be noted that both species were included in material used for the description of *Gobius hinsbyi* in McCulloch and Ogilby (1919). The name originated from a Johnston manuscript, where it was not described and was a *nomen nudum*. That paper was later published by Whitley (1929). The species was described by McCulloch and Ogilby (1919), based largely on one specimen (AMS I.14200), which is figured here as *Nesogobius maccullochi*. McCulloch and Ogilby (1919) mention the Tasmanian Museum specimen as the type and give a brief description of the specimen and indicate that they believed it to be identical to the described specimen. It is regarded here that the use of the wording “the type” clearly indicates that the holotype is the specimen in the Tasmanian Museum. Eschmeyer (1998) listed the specimen as a lectotype, indicating that he believed the figured specimens should have been designated the lectotype. Whether the Tasmanian Museum specimen is a lectotype or holotype does not affect the identity of the species because literature references to “the type” and to the lectotype refer to the same specimen.

Acknowledgements

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